

Abstract:

The purpose of this experiment was to test the relationship between climate change and diseases carried by mosquitoes. Students from Wooster Middle School (WMS) monitored weather using GLOBE Atmosphere protocols and Pond/Stream Conditions using GLOBE Hydrology protocols. We then did independent experiments using mosquito eggs/larvae to better understand how factors like temperature, pH, larval concentration, light and water type affected mosquito hatching and growth. Our results were very inconclusive due to limitations in sampling and errors in the mosquito growth chambers.

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**Acknowledgements: We would like to thank Emilia Fusarelli for helping us through our mosquito experiments as well as Beth Hines from Yale Peabody Museum for her background knowledge and workshop.**

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## Introduction (all groups)

We are members of the Globe program from David Wooster Middle School in Stratford, CT in the United States. We would like to share some data we have collected at our school, including hydrology data from the Wooster pond, phenology data from the trees, and atmospheric data we collected using our weather station. We are also using this data as part of our experiment involving the factors that impact mosquito's growth and abundance. Hopefully this data can help us all gain a better understanding of the life cycles going on around us and how they are affected by climate change.

At our weather station, we followed GLOBE protocols and have thermometers used to find the temperature of the ground and air. We also have a rain gauge which we use to measure rainfall and check it daily. Factors like temperature and precipitation have a large impact on insect's life cycles. We also have been collecting phenology data on our trees using GLOBE green up and green down procedures. Data like this can help us notice any seasonal changes going on. For example, if one season is longer than normal, if insect populations are high or emerging early, etc. All of this is important to our studies of climate and mosquitos. Unfortunately, this falls phenology data was compromised due to hurricane Sandy which blew most of the leaves off the trees. Information gathered at the pond includes PH, temperature, conductivity, and water clarity. We closely monitor these data points using GLOBE hydrology at our four data testing sites, as well as the wildlife which calls Wooster pond their home. For our mosquito experiment, we tested the effect of different variables like PH, water type, and food amounts, on the mosquito's development. The results of our experiment were unfortunately inconclusive. Our overall question was how does climate change affect the rate of mosquito borne diseases in Connecticut?(West Nile Virus and Eastern Equine Encephalitis)

## Procedure: Mosquito Experiments (all groups)

1. Conduct background research on the life cycles and habits of mosquitoes.
2. Fill Mosquito chambers with distilled water
3. Add mosquito eggs to chambers. Monitor for hatching
4. Remove stage one larvae from chamber using droppers/pipettes.
5. Place into microcosm experiment chambers (baby food jars) following the experiments designs.
  - a. 50mL of water per chamber
  - b. 5 larvae per chamber (except concentration group)
  - c. Use only distilled water
  - d. All chambers will be kept at room temperature, out of sunlight from windows
  - e. 6 air holes per chamber lid (small so mosquitoes cannot escape)
  - f. Check for adult mosquitoes and or 2<sup>nd</sup> and 3<sup>rd</sup> stage larvae each day
6. Create 3 trials for each level of IV
7. Mosquito growth chamber will serve as a control

Experiment Design/Data Tables (summaries)

IV: Temperature °C	D.V. # of mosquitoes reaching adulthood			Average
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	
5 (fridge)	0	0	0	0
21(room)	1	0	2	1
37.7(incubator)	2	1	0	1

IV: pH	D.V. # of mosquitoes reaching adulthood			Average
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	
5	0	1	0	.333
7	1	1	2	1.333
9	1	0	0	.333

IV: Light	D.V. # of mosquitoes reaching adulthood			Average
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	
Full Sunlight (12hrs daily from full spectrum lamp)	0	0	0	0
Windowsill	0	0	0	0
Drawer	0	0	0	0

IV: Concentration of larvae	D.V. # of mosquitoes reaching adulthood			Average
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	
4	1	0	1	0.666
8	1	1	0	0.666
12	2	1	0	1

IV: Water type	D.V. # of mosquitoes reaching adulthood			Average
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	
Distilled Water	0	0	0	0
Tap Water	0	1	0	.333
Pond Water	2	3	1	2
Salt Water	0	0	0	0

#### Data Discussion:

TEMPERATURE GROUP – Our hypothesis is that as temperature increases the number of larvae that become adults will increase. The # of larvae reaching adulthood seemed to increase as temperature increased. The larvae definitely grew faster in warmer trials. The results seem inconclusive because the same number of mosquitoes hatched in both the 21 and 37 degree experiments (1 on average). We think that doing more experiments between 21 and 5 degrees might show more about when mosquitoes hatch. Our hypothesis was not answered.

pH Group – Our hypothesis was that if the water had a neutral pH (7) then more adults would form because the mosquitoes would be more comfortable. Mosquitoes will develop into adults better if the pH is between 5 and 9. When the pH was 5, only .33 mosquitoes became adults. When the pH was 7, 1.33 mosquitoes became adults. When the PH was 9, 0.33 mosquitoes became adults. Our results are not specific enough to be conclusive about the best pH for mosquitoes to grow.

Light Group – We have nothing to report. Our hypothesis was that if mosquitoes had natural light they would grow into adults faster. None of our mosquito larvae reached adulthood. We think this may be due to temperature. The mosquitoes under the grow light got too hot. The counters in our lab are black and we think the sunlight may have cooked the mosquitoes there. We don't know why none of the mosquitoes in the dark developed.

Concentration of Larvae – The same number of mosquitoes developed into adults for our 4 and 8 larvae jars. (0.666 on average) This led us initially to think that the number of Larvae per mL of water did matter and only 0.666 larvae would develop into adults for every 50mL of water. Then our jars with 12 larvae grew an average of 1.0 adults per 50mL which meant the first conclusion was wrong.

Water Type Group – If mosquitoes grow in water they normally grow in (pond water) then they will be more successful because they are doing what is natural for their lives. Our data supported our hypothesis with four times as many mosquitoes becoming adults in the pond water than any other water type.